

## 1. Short Answer Questions

Primary differences between TensorFlow and PyTorch.

Feature	TensorFlow	PyTorch
Development Style	Static computation graph (TF 1.x); dynamic via tf.function in TF 2.x	Dynamic computation graph (eager execution)
Debugging	Harder due to graph abstraction	Easier with native Python debugging tools
Popularity in Production	More mature for production (e.g., TensorFlow Serving, TFLite)	Increasing, but still catching up in deployment tools
Ease of Learning	Steeper learning curve initially	More Pythonic and intuitive
Visualization	TensorBoard	Integration available, but less central

When to choose one:

- **TensorFlow:** Ideal for **production-ready, scalable** applications with built-in tools for **mobile, web, and cloud deployment**.
- **PyTorch:** Better suited for **research, experimentation, and prototyping** due to its dynamic and intuitive nature.

## 2. two use cases for Jupyter Notebooks in AI development.

### 1. Interactive Experimentation & Prototyping

- Jupyter allows data scientists and AI engineers to run code **cell by cell**, visualize outputs instantly, and tweak models/parameters quickly.

### 2. Data Exploration & Visualization

- With libraries like pandas, matplotlib, and seaborn, Jupyter is great for **exploratory data analysis (EDA)**—making it easier to clean data, test hypotheses, and visualize patterns before training models.

## 3. How spaCy enhance NLP tasks compared to basic Python string operations

- **spaCy** is a **powerful NLP library** that offers:

- **Tokenization, Part-of-Speech (POS) tagging, Named Entity Recognition (NER), Dependency Parsing**, and more.
  - It uses **pretrained language models** for linguistic tasks.
- **Compared to basic string operations** (split(), replace(), etc.):
  - **Accuracy**: spaCy understands **linguistic structure**, not just characters.
  - **Context Awareness**: Recognizes **entities** (e.g., person names, locations).
  - **Efficiency**: Built in Cython for speed and optimized for large-scale NLP tasks.